

**INSTITUTE OF PUBLIC HEALTH**  
**COLLEGE OF MEDICINE AND HEALTH SCIENCE**  
**UNIVERSITY OF GONDAR**



PREVALENCE AND ASSOCIATED FACTORS OF UNDER NUTRITION AMONG  
MALE ADULT PRISON INMATES IN NORTH GONDAR PRISON, NORTHWEST  
ETHIOPIA, 2015.

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## Acronyms

AIDS-----	Acquired Immune Deficiency Syndrome
BMI-----	Body Mass Index
DDS-----	Dietary Diversity Score
ETB-----	Ethiopian Birr
FANTA-----	Food and Nutrition Technical Assistance
HIV-----	Human Immune Deficiency Virus
OR-----	Odd Ratio
SPSS-----	Statistical Package for Social Science
SSA-----	Sub Saharan Africa
TB-----	Tuberculosis
UNJHRO-----	United Nations Joint Human Rights Office

## Contents

Acknowledgement.....	i
Acronyms.....	ii
List of Tables.....	v
List of Figure .....	v
Abstract.....	vi
1. Introduction.....	1
1.1. Statement of the problem.....	1
1.2. Literature review .....	3
1.2.1. Magnitude of malnutrition among prison inmates .....	3
1.2.2. Factors associated with nutritional status of prison inmates .....	4
1.2.2.6. Work activity in the prison.....	5
1.2.3. Conceptual frame work.....	6
1.3. Justifications.....	7
2. Objectives.....	8
2.1. General objectives .....	8
2.2. Specific objectives.....	8
3. Methods .....	9
3.1. Study design .....	9
3.2. Study area and period .....	9
3.3. Source population .....	9
3.4. Study population.....	9
3.5. Inclusion and exclusion criteria .....	9
3.6. Sample size and sampling procedures.....	9
3.6.1. Sample size.....	9
3.6.2. Sampling technique.....	10
3.7. Variables of the study .....	10
3.7.1. Dependent variables .....	10
3.7.2. Independent variables .....	10
3.8. Operational definitions.....	11
3.9. Data Collection procedures .....	11
3.10. Data processing and analysis .....	12
3.11. Ethical considerations.....	12

3.12. Dissemination of result .....	13
4. Result .....	14
5. Discussion.....	28
6. Conclusion.....	30
7. Recommendation.....	30
8. Reference.....	31
ANNEX.....	32
Annex A: Consent form .....	32
Annex B: Information sheets .....	33
Annex C: Amharic version of informed consent and information sheet.....	35
Annex D: Questionnaire (English version) .....	36
Annex E : Amharic Version questionnaire.....	40
Annex F: Assurance of investigation.....	43
Annex G: Declaration.....	44
Annex H: BMI calculation chart.....	46

## List of Tables

Table1: Frequency distribution of socio demographic characteristics among prison inmates in North Gondar, Northwest Ethiopia, 2015. ....	15
Table 2: Frequency distribution of behavioral and medical factors among prison inmates in North Gondar prison, Northwest Ethiopia,2015. ....	17
Table 3: Frequency distribution of physical activity and presence of job in the prison among prison inmates in North Gondar prison, Northwest Ethiopia, 2015. ....	22
Table 4: Bivariate and multivariate analysis of factors associated with under nutrition among prison inmates in North Gondar prison, Northwest Ethiopia,2015. ....	22

## List of Figure

Figure 1: conceptual frame work for factors associated with nutritional status among North Gondar prison inmates, Northwest Ethiopia.....	6
Figure 2: Meal frequency per week among male adult prison inmates in North Gondar prison, Northwest Ethiopia, 2015. ....	19
Figure 3: Dietary diversity score per week among male adult prison inmates in North Gondar prison, Northwest Ethiopia, 2015. ....	20
Figure 4: Prevalence of under nutrition among prison inmates in North Gondar prison, Northwest Ethiopia, 2015. ....	24

## **Abstract**

**Introduction:** Malnutrition (under nutrition) is one of the health problems in developing countries, and its occurrence is aggravated by poor hygienic condition and little access to health problem. Prison is an institution where diverse people lived who had violated the law, some of them possibly innocent lives, it is not just a center for punishing the individual who violet the law; but also a center of rehabilitation as well, the aim of this study is identifying factors associated with under nutrition to alleviate the problem.

**Objective:** To assess the prevalence and associated factors of under nutrition among prison inmate, in North Gondar prison, Northwest Ethiopia in 2015.

**Methods:** Institutional based cross sectional study was conducted in north Gondar prison from March 1 to 30, 2015. Simple random sampling techniques was employed to recruit a total of 420 participants during the study period .Data has been collected by using pre tested structured questionnaire which consisting of characteristics related to socio demographic profile, associated factors for under nutrition and Anthropometric characteristics. Cleaned data was entered to Epi info version 7 and transferred to SPSS version 20 for further analysis, Bivariate and multivariate logistic regression was fitted to identify factors associated with under nutrition. Significance variable was obtained at crude and adjusted odds ratio with 95% CI and  $p < 0.05$ .

**Result** The overall prevalence of under nutrition in this study area was 38.8% out of this 2.6% severe malnutrition, 19% moderate malnutrition and 78.4% mild malnutrition. Factors which are significantly associated with under nutrition were additional food, illness, food diversity and presence of job in the prison.

**Conclusion and recommendation** This result showed that the prevalence of under nutrition among prison inmates of incarcerated for at least 6 months was high especially inmates who didn't get additional food and had an illness, thus the prison authority design a strategy for intervention concerning about increasing personal value and food diversity.

**Key words:** - prison inmates, associated factors, under nutrition.



# **1. Introduction**

## **1.1. Statement of the problem**

Malnutrition (under nutrition) is one of the health problem in developing countries, and its occurrence is aggravated by poor hygienic condition and little access to health problem [1].

Prison is an institution where diverse people lived who had violated the law, some of them possibly innocent lives [2]. Currently prison is not just a center for punishing the individual who violet the law; but also a center of rehabilitation as well [3]. According to the report released by International center for prison studies, prison overcrowding is a central problem in prison management around the globe[4]. Similarly a report released by UNJHRO in 2010 about the prison condition of democratic republic Congo there was over crowded and suffocation which was the cause for death within the prison with density of the room is about 191inmates per 77meter square area[5].

In low income countries nutrition related issues are often neglected specifically in vulnerable group like prisoners [6]. Even if maintaining of good nutritional status was human right and one of the strategies to effectively address the challenges that related to under nutrition [7].

Prisoners are more susceptible to develop nutritional deficiencies especially micronutrients required for optimum health and prevention of chronic diseases and their complications [8].In central prison of guinea there was high prevalence of malnutrition and also it is primary cause for the death of seven inmates per month [9].

Food plays a major role in the life of prisoners, poorly designed meal, inadequate portion sizes, lack of variety and poorly cooked food can contribute to serious health conditions [3].

The prisons' health system is inadequate in almost all developing countries and, particularly in Sub-Saharan Africa (SSA), like Zimbabwe, and democratic republic of Congo, elsewhere severe malnutrition has been documented [10]. to make matters worse, prison populations have high prevalence of energy depletion infectious diseases like Tuberculosis and HIV/AIDS [11].

Data on nutrition or nutritional state is not routinely collected within prisons. It is feasible however to describe the food choices available to prisoners [12].

In North Gondar prison there was high prevalence of malnutrition with related to chronic illness and living condition [11].

Most of studies done on these vulnerable groups described about the prevalence of under nutrition; however this study tried to identify prevalence and determinants of under nutrition for specific nutritional intervention.

## **1.2. Literature review**

Malnutrition generally refers both to under nutrition and over nutrition, Many factors can cause malnutrition, most of which relate to inadequate diet or severe and repeated infections [13, 14]. Inadequate diet and disease, in turn, are closely linked to the general standard of living, the environmental conditions, and whether a population is able to meet its basic needs such as food, housing and health care[8]. Malnutrition is thus a health outcome as well as a risk factor for disease and exacerbated and it can increase the risk of both morbidity and mortality [15].

### **1.2.1. Magnitude of malnutrition among prison inmates**

Nutritional status of prison inmates were assessed in Philippines and conclude that, protein and nutritional status among adult male inmates in San Ramon Prison and Penal Farm were adequate based on anthropometric and biochemical assessment[16]. However a study conducted in Pakistan noted that the prevalence of underweight increase from time of imprisonment to time of study that is from 22.2% to 39.7% [8]. Nutritional status and non communicable disease are interrelated that is mal nutrition (over nutrition ) increase the chance of chronic illness like diabetes mellitus thus [17]. A study done by Mukhtar Salina., et al on the prevalence and risk factors of non communicable diseases among female prisoner in Pakistan those individuals who have a case are overweight(26.4% ), and obese(27.13%) [18].

A study conducted in Nigeria stated that 59% had normal weight, 29% were overweight, 6% had obesity, while 4% were underweight [3]. similar study done in Papua New Guinea among prison inmates had also the same result on underweight (5%) and overweight (15%)(BMI  $\geq 25$ -29.9)[2]. In the contrary, descriptive study done among prison inmates in north Gondar prison, Ethiopia states that there was high prevalence of under nutrition about 46.2% [11].

## **1.2.2.Factors associated with nutritional status of prison inmates**

### **1.2.2.1 Socio demographic characteristics**

Research done in England by Oxford University among inmates in 2012, found that male prisoners were less likely to be overweight or obese compared with the male population of similar age in that country [12].

**Educational status** is the factor for nutritional status, Prison inmates who malnourished were less educated compared with the general population [19].

### **Duration of stay in the prison**

Year of stay in the prison has its own impact in nutritional status, inmates in Karachi (Pakistan), among inmates who stay in the prison for at least 6 months the prevalence of under nutrition increase from time of imprisoned to time of study that is from 22.2% to 39.7% [8].

### **1.2.2.2 Known chronic illness related factors**

Infectious diseases like tuberculosis and HIV/AIDS have the capacity to turn borderline nutritional deficiencies into severe malnutrition [20]. Malnutrition independently cause progressive damage to the immune system and increased susceptibility to infection and infection can also cause malnutrition[14]. Study conducted in north Gondar prison (Ethiopia) on the prevalence of tuberculosis, The odds of TB was 9 times higher than the general population of north Gondar [11]. Similarly in North central Ethiopia, shewa robit prison the prevalence of energy depletion parasitic infectious was about 61.8% [21].

### **1.2.2.3 Physical activity related factors.**

Physical activity is one of the factors of nutritional status in prison inmates [13]. Most of the study subjects in Karachi Pakistan were not perform regular exercise, that is only 9% of inmates perform regular exercise, and prevent the occurrence of over nutrition related chronic illness like diabetes mellitus but not an effect on the occurrence of under nutrition [8].

### **1.2.2.4 Dietary diversity and score factors**

The median intakes of nutrients were also the factors for nutritional status by 24hours recall dietary assessment. on average inmates who received food regularly once a week from visitors had good nutritional status compared with prisoners who did not receive food gifts [8]. Similarly studies done in New Guinea inmates who receive extra food from their relative or visitors have extra micronutrient concentration like 35%extra

vitamin “A” of the recommended daily allowance(RDA) ,11%extra riboflavin of RDA and 49%extra vitamin “C” by using biochemical analysis compared with prisoner who didn’t receive food gift [2].

#### **1.2.2.5 Behavioral factor (Smoking status)**

Smoking is a factor for human health including nutritional status but few know about the effect of smoking on nutritional aspect, it has negative impact on food intake and absorption of nutrients [22].

A study done in new guinea majority of prison inmates(77%) were smoker and it is significantly associated with under nutrition with P-value <0.001.similarly in oyo state (Nigeria) 80% of them are current smoker [2, 3].

#### **1.2.2.6. Work activity in the prison**

Work is a factor for nutritional status that is if an individual have extra income generating activity, he may get diversified food items , study done in Nigeria, inmates perform different activity inside the prison, almost 50% of them have job in the prison and also low prevalence of under nutrition among them which is about 4 %[3].

### 1.2.3. Conceptual frame work

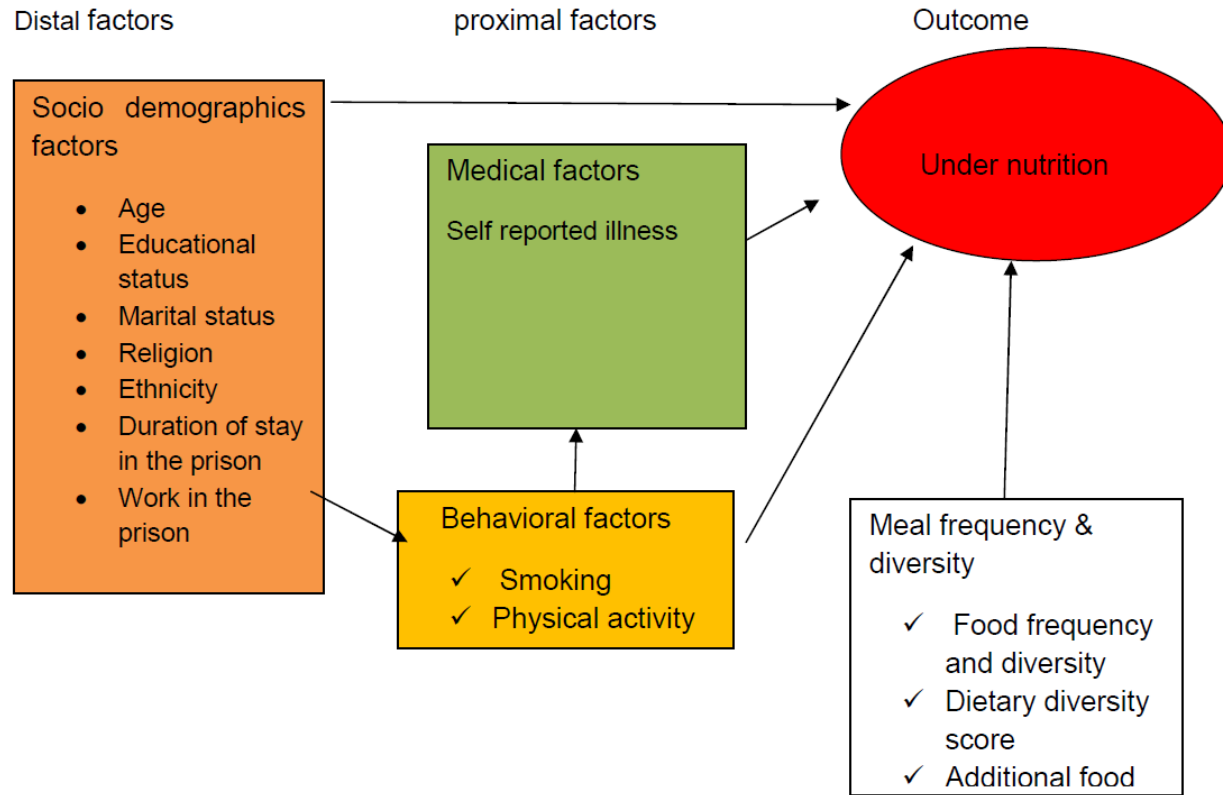


Figure 1 conceptual frame work for factors associated with malnutrition among North Gondar prison inmates, Northwest Ethiopia, 2015.(Source: 1, 2,13

### **1.3. Justifications**

A study done in north Gondar prison showed that there was high prevalence of under nutrition ,and the investigators suggest that the determinants for poor nutrition in the prison need also further investigation [11].

The prisons' health system is inadequate in almost all developing countries and, particularly in Sub-Saharan Africa (SSA), and high prevalence of energy depletion infectious diseases, like pulmonary tuberculosis and HIV/AIDS which leads to malnutrition [10].

There is great gap in the prevalence of malnutrition among prison inmates in Guinea ( 5%) and in north Gondar prison (46.2% ) thus this study is needed to identify the factors of the gap between this two study area on under nutrition [2, 11].

Even if prison inmate is one of the segments of population there is enough literature about nutritional status of prison inmate.

## **2. Objectives**

### **2.1. General objectives**

- To assess the prevalence and associated factors of under nutrition among prison inmates in North Gondar prison, Northwest Ethiopia, in 2015.

### **2.2. Specific objectives**

- To determine the prevalence of under nutrition among prison inmates in north Gondar prison, Northwest Ethiopia, in 2015.
- To identify factors associated with under nutrition among prison inmates in North Gondar prison, Northwest Ethiopia, in 2015.



### **3. Methods**

#### **3.1. Study design**

Institutional based cross sectional study was conducted to assess the nutritional status and associated factors among prison inmates in north Gondar prison, Northwest Ethiopia.

#### **3.2. Study area and period**

The study was conducted in north Gondar prison inmates from March 1 to 30, 2015. The prison was located in the historic city of Gondar, at kebele10. It accommodates thousands of inmates every year and was one of the major prisons in North Gondar Zone. It had 2,700 prison inmates at time of data collection. The prison has one primary school and health facility with a total of 7 health professional (4 clinical nurses, 1 pharmacy technician, 1 laboratory technician and 1 environmental health professional.)

#### **3.3. Source population**

All prison inmates in north Gondar prison.

#### **3.4. Study population**

Prison inmates in north Gondar prison who stay  $\geq 6$  months was included in the study.

#### **3.5. Inclusion and exclusion criteria**

##### **Inclusion criteria:-**

All prison inmates of age greater  $\geq 18$  years and stay for at least 6 months.

##### **Exclusion criteria:-**

Prisoners who are severely ill and physically impaired

#### **3.6. Sample size and sampling procedures**

##### **3.6.1. Sample size**

By considering the following assumptions the total sample size for this study is calculated as:

- 95% confidence interval
- Marginal error of 5%
- Proportion 46.2%
- Non response rate 10%
- Using single proportion formula

- $n = z_{\alpha/2}^2 p(1-p)/d^2$

$$= (1.96)^2 (0.462) (0.538) / (0.05)^2$$

$$= 381$$

None response rate 10%: 39

Total sample size: 381+39=420

### **3.6.2. Sampling technique**

Simple random sampling technique was employed to recruit a total of 420 study participants during the study periods. By taking the list of all prison inmates ID number from prison administration office, lottery methods was utilized to select the study participants.

## **3.7. Variables of the study**

### **3.7.1. Dependent variables**

Under nutrition

### **3.7.2. Independent variables**

Socio Demographic Characteristics

- ✓ Age
- ✓ Religion
- ✓ Ethnicity
- ✓ Educational status , Marital status
- ✓ Duration of stay in the prison
- ✓ Work in the prison

Behavioral factors

- ✓ Smoking
- ✓ Physical activity

Medical factors

- ✓ Known chronic disease

Dietary status

- ✓ Meal frequency and dietary diversity
- ✓ Dietary Diversity Score per 24 hours

### **3.8. Operational definitions**

**Prison inmate:** - an individual who stayed in a prison for at least 6 months

#### **Nutritional status by BMI for age**

Under weight:-BMI less than 18.5

Normal weight:-BMI 18.5-24.9

Over weight: - BMI 25-29.9

Obesity: - BMI  $\geq 30$

**Regular physical Exercise:** - at least three per week planned repetitive body movement produced by muscle action that increases energy expenditure.

**Dietary diversity score:** - relates to nutrient adequacy in which

$\leq 3$  food groups: - poor.

4-6 food groups: - medium.

$\geq 7$  food groups: - Good

### **3.9. Data Collection procedures**

Data was collected by using interviewer administered pretested structured questionnaire. Anthropometries measurements of participants was determined by recording the weight and height of individuals and dietary diversity score of study participants was also determined by employing the 24 hours recall method. The study participants were interviewed to list of all foods and drinks taken before 24 hours of the survey which were adopted from FANTA 2006. The questionnaire was prepared first in English language and then translated to Amharic language. 3 data collectors those who have diploma in nursing and 1 /Bsc nurse were participate in the data collection process.

Data quality was insured by translating the questionnaire from English to Amharic then back to English to see consistency. Pre test was conducted on 5% of the study participants [23] in south Gondar prison inmates.

Training of data collectors was conducted for about 2 day to have consensus and the same understanding about the objective of the study, how to take measurement and how to approach participants ethically. The completeness, accuracy and consistency of the collected data were checked daily by responsible supervisor and principal investigator.

### **3.10. Data processing and analysis**

Data was cleaned, coded and entered into Epi-info statistical software Version 7 and then transferred to SPSS version 20.0 for further analysis. Anthropometric measurements were converted to BMI to assess the nutritional status of the study subject then compared with the reference (WHO 2006 reference), BMI was computed by weight in kilogram divided by height in meter square ( $\text{kg/m}^2$ ). Descriptive statistics were presented with graphs and tables.

The association between dependent and independent variables were analyzed using Odds ratio with 95% confidence interval. The relative contribution of each variable to outcome of interest was assessed by logistic regression analysis to determine the effect of numerous factors on the outcome variable and to control confounding effect backward logistic regression methods was used. Those variables with p-value of less than 0.05 in multivariate analysis were considered as significant.

### **3.11. Ethical considerations**

Ethical clearance was obtained from the Ethical Review Board of University of Gondar. Written letter for the next steps was secured from North Gondar prison administration office. Consent was obtained from each study participants after informing them all the purpose, benefit, risk, the confidentiality of the information and the voluntary nature of the participation in the study.

### **3.12. Dissemination of result**

The result of this study will be presented to University of Gondar as partial fulfillment of the degree of Master of Science in applied human nutrition. It will be submitted to north Gondar prison administrative office and other who are concerned at regional or federal level.

It will be also presented at seminar and workshops, and submitted to different journal for publications.

## **4. Result**

### **4.1 Socio-demographic characteristics of the respondents**

A total of 407 prison inmates were interviewed in the study, with response rate of 96.9%. The mean age of the respondents was 31.72 with standard deviation of  $\pm 9.57$ . One hundred eighty three (45%) of the participants were in the age group of 26 to 35 years. About 199 (48.9%) prison inmates were single and most of them 374 (91.9%) were Christian Orthodox. Nearly one third of the participants 129 (31.7%) had primary education (Table 1).

**Table 1: Socio demographic characteristics of male adult prison inmates in north Gondar prison, Northwest Ethiopia, 2015. (n= 407).**

Variables	Frequency	Percent (%)
Age group (in year)		
<b>18-25</b>	115	28.3
<b>26- 35</b>	183	45.0
<b>36-45</b>	67	16.5
<b>≥ 46</b>	42	10.3
Marital status		
<b>Single</b>	199	48.9
<b>Married</b>	153	37.6
<b>Divorced</b>	39	9.6
<b>Widowed</b>	16	3.9
Educational Status		
<b>Unable to read and write</b>	93	22.9
<b>Able to read and write</b>	34	8.4
<b>Primary education</b>	129	31.7
<b>Secondary education</b>	117	28.7
<b>Tertiary education</b>	34	8.4
Religion		
<b>Orthodox</b>	374	91.9
<b>Muslim</b>	33	8.1
Ethnicity		
<b>Amhara</b>	385	94.6
<b>Tigre</b>	16	3.9
<b>Oromo</b>	6	1.5
Duration of stay in the prison		
6 months -12 months	169	41.5
13 months -24 months	48	11.8
25 months -60 months	113	27.8
>= 61 months	77	18.9

## **4.2 Behavioral and health related characteristics of the respondents**

Out of the total respondents 95 (23.8%) were current cigarette smoker from which most of them 70(72%) were smoke  $\leq 10$  cigarettes/day. And one hundred forty one respondents 141(34.6%) had history of self reported illness (Table 2).



Table 2: Behavioral and health related characteristics of male adult prison inmates in North Gondar prison, Northwest Ethiopia, 2015

Characteristics	Frequency	Percent (%)
<b>Current Smoking status</b>		
Yes	95	23.3
No	312	76.7
<b>Frequency of smoke cigarette/day</b>		
< 10 cigarette/day	70	73.7
≥10 Cigarette/day	25	26.3
<b>Current illness status</b>		
Yes	141	34.6
No	266	65.4
<b>Types of Self reported illness</b>		
Diarrheal disease	43	30.5
Respiratory tract infection	30	21.3
Non communicable chronic illness	18	12.8
HIV/AIDS	16	11.3
Gastritis	15	10.6
Tuberculosis	12	8.5
Others	7	5

Others: - typhoid fever, malaria, UTI...

### **4.3 Meal frequency and diversity among the respondents**

Most of the respondents 398(97.8%) were eat three times/day, but greater than half of the respondents did not eat meat and meat products (68.8%), fruit (57.2%), milk and milk product (87.7%) and egg (89.7%). Using 24hours dietary diversity score record most of the participants (57.0%) eat 4 or 5 food items/24hours out of the twelve food items (Figure 2).

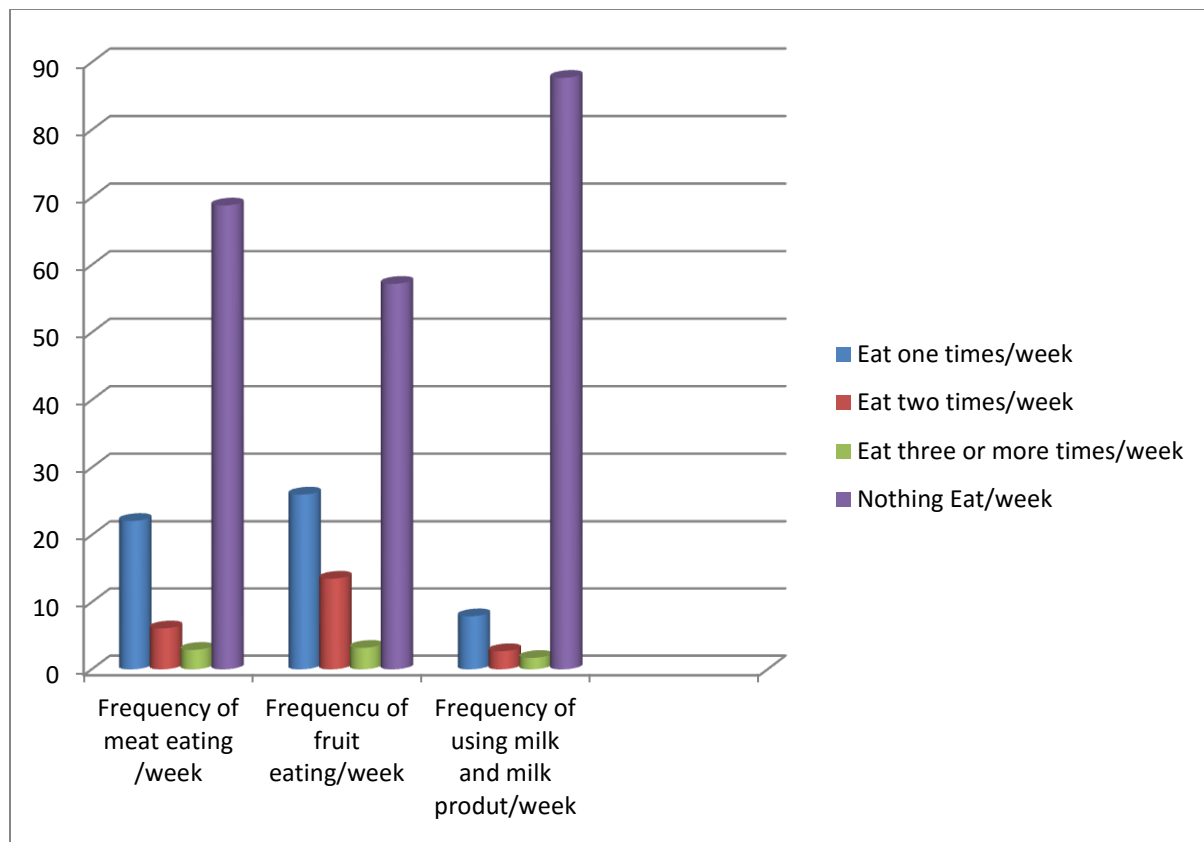


Figure 2:- Meal frequency per week among adult male prison inmates in North Gondar prison, Northwest, Ethiopia, 2015.

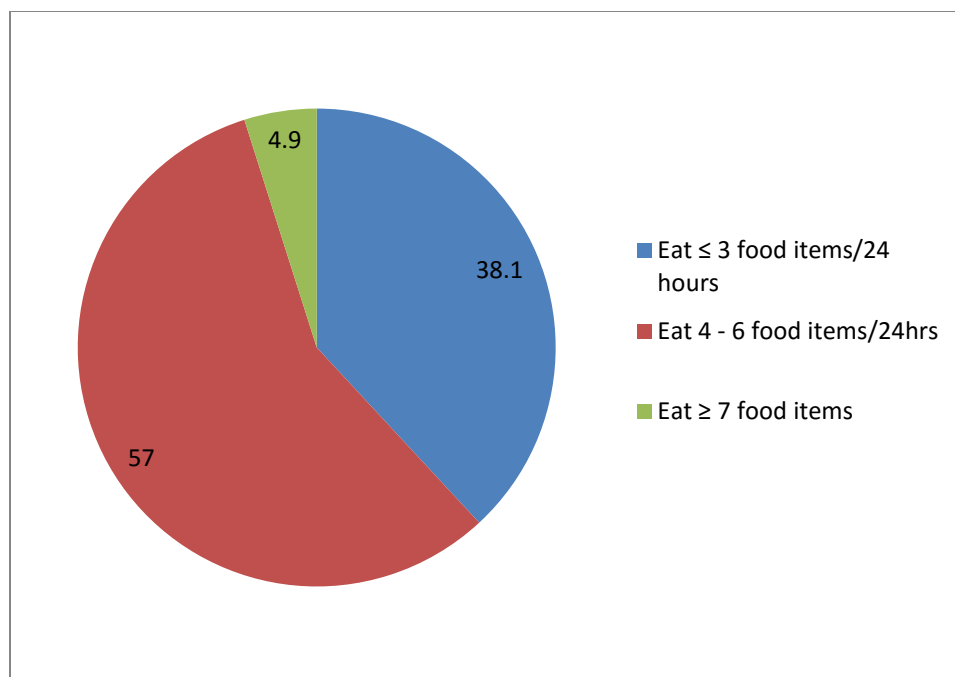


Fig 3:- Dietary Diversity Score per 24hours among male adult prison inmates in North Gondar prison, Northwest, Ethiopia, 2015.

#### **4.4 physical activity and presence of work in the prison among male adult prison inmates in north Gondar prison, northwest Ethiopia, 2015.**

About 246(60.4%) didn't perform regular physical exercise and 245(60.2%) of them engaged in different work activities, in which handcraft is the most common (Table 3).

Table 3: physical activity and presence of work in the prison among male adults prison inmates in north Gondar prison, northwest Ethiopia, 2015.

Characteristics	Frequency	Percent(%)
<b>Physical exercise</b>		
Yes	161	39.6
No	246	60.4
<b>Presence of work in prison</b>		
Yes	245	60.2
No	162	39.8
<b>Types of work in the prison</b>		
Steel work	3	1.2
Wood work	9	3.7
Hand craft (edetibeb)	213	86.9
Work in cafeteria	20	8.2

#### **4.5 Prevalence of under nutrition**

The mean body mass index of the participants were 19.78kg/m<sup>2</sup> with (SD =±2.63). Among the total participants 158(38.8%) were under nourished (BMI <18.5kg/m<sup>2</sup>) in which 4 (2.6%) were found with severe acute malnutrition, and 30(19%) with moderate acute malnutrition (figure 4)

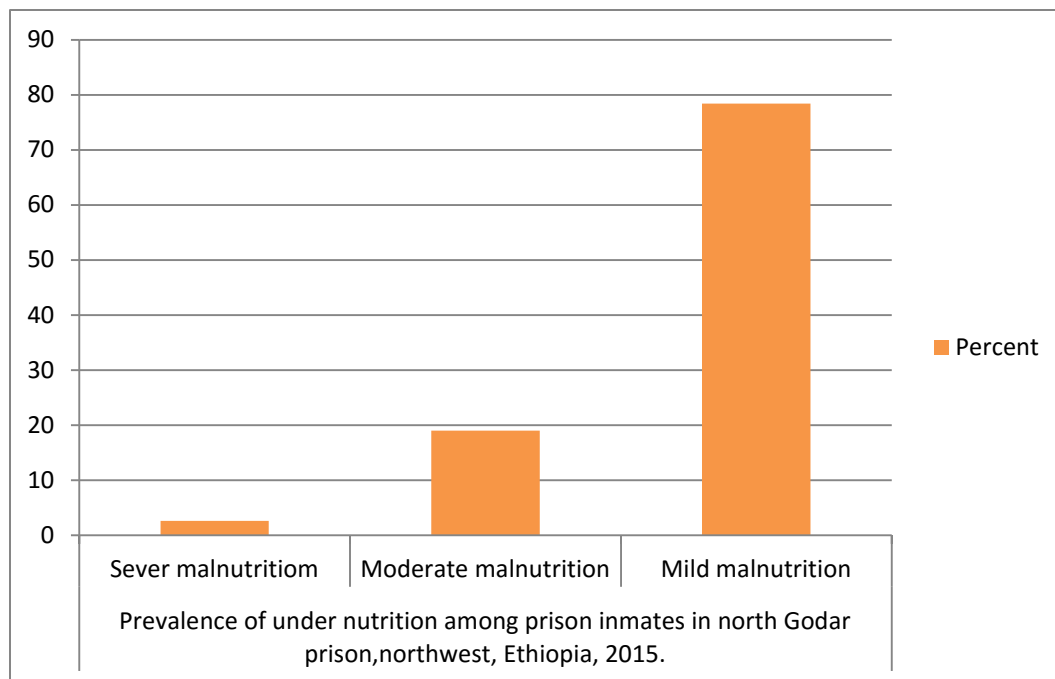


Figure 4. Prevalence of under nutrition among male adult prison inmates in North Gondar prison, Northwest, Ethiopia, 2015



**Factors associated with under nutrition among prison inmates in north Gondar prison, northwest, Ethiopia, 2015.**

The result of bivariate analysis showed that there was significant association between educational status, marital status, religion, current illness, frequency of using milk and milk product, Dietary diversity score per 24hours, additional food, physical exercise, work in prison, and duration of stay.

But after controlling for possible confounder the result of multivariate analysis reveal that self reported illness, work in the prison, frequency of food intake like milk, and milk product, duration of stay in the prison, and additional food were significantly associated with under nutrition (Table 4).

Table 4:-Bivariate and Multivariate analysis of factors associated with under nutrition among prison inmates in north Gondar prison, northwest, Ethiopia, 2015, (n=407).

Variables	Under nutrition		COR(95%CI)	AOR(95%CI)
	Yes	No		
<b>Age(year)</b>				
18-25	39	76	1	1
26- 35	68	115	1.15(0.707-1.879)	0.9(0.469-1.738)
36-45	30	37	1.58(0.852-2.929)	1.03(0.425-2.506)
>= 46	21	21	1.95(0.951-3.994)	0.88(0.306-2.506)
<b>Educational Status</b>				
Unable to read and write	48	45	2.56(1.103-5.944)	0.89(0.299-2.639)
Able to read and write	18	16	2.70(0.994-7.331)	1.19(0.341-4.201)
Primary education	42	87	1.16(0.508-2.643)	0.83(0.288-2.401)
Secondary education	40	77	1.25(0.543-2.861)	1.4(0.496-3.965)
Tertiary education	10	24	1	1
<b>Marital status</b>				
Single	73	126	0.35(0.121-0.996)	0.59(0.149-2.390)
Married	55	98	0.34(0.116-0.976)	0.45(0.114-1.783)
Divorced	20	19	0.63(0.192-2.078)	0.49(0.110-2.259)
Widowed	10	6	1	1
<b>Religion</b>				
Orthodox	151	223	2.52(1.065-5.942)	1.6(0.528-4.761)
Muslim	7	26	1	1
<b>Ethnicity</b>				
Amhara	153	232	1.32(0.239-7.290)	2.83(0.396-20.190)
Tigre	3	13	0.46(0.056-3.811)	0.65(0.044-9.437)
Oromo	2	4	1	1
<b>Current Smoking status</b>				
Yes	33	62	0.796(0.493-1.286)	1.42(0.176-11.42)
No	125	187	1	1
<b>Frequency of smoke cigarette/day</b>				
1-10 cigarette/day	22	48	1	1
>= 10 Cigarette/day	11	14	1.175(0.517-2.673)	1.9 (0.729-4.97)
<b>Current illness status</b>				
Yes	71	70	2.09(1.374-3.169)	<b>1.6(1.008-2.69)**</b>
No	87	179	1	<b>1</b>
<b>Frequency of Meat eating/week</b>				
Three times or more/week	3	9	1	1
Two times/week	5	20	0.69(0.232-2.036)	0.62(0.152 -2.517)
One times/week	24	66	0.92(0.229-3.672)	0.71 (0.144 -3.513)
Nothing/week	126	154	2.25(1.333-3.797)	0.78 (0.366 -1.667)

<b>Frequency of fruit eating/week</b>				
Three times or more /week	4	9 74	1	1
Two times/week	13	42	0.72(0.339-1.512)	0.72 (0.292 -1.785)
One times/week	32	74	1.03(0.295-3.582)	1.7 (0.366 -7.939)
Nothing/week	109	124	2.03(1.248-3.312)	1.2 (0.624 -2.349)
<b>Frequency of Milk &amp; milk product using/week</b>				
One or more times/week	8	42	0.263(0.120-0.576)	<b>0.4(0.173-0.98)**</b>
Nothing/week	150	207	1	
<b>Number of food items using in the last 24 hours</b>				
≤ 3 food items	74	81	17.36(2.267-132.885)	5.39 (0.639 -45.586 )
4-5 food items	83	149	10.89(1.392-80.484)	5.19 (0.630 -42. 890)
≥ 6 food items	1	19	1	1
<b>Presence of additional foods</b>				
yes	48	183	1	1
No	110	66	6.35(4.090-9.872)	<b>4.62 (2.844 -7.494 )**</b>
<b>Physical exercise</b>				
Yes	41	120	2.66(1.72-4.097)	1.27 (0.748 -2.160 )
No	117	129	1	1
<b>Presence of work in prison</b>				
Yes	67	178	0.294(0.193-0.446)	<b>0.346 (0.208 -0.574)**</b>
No	91	71	1	1
<b>Duration of stay</b>				
6 months -12 months	57	112	1	1
13 months -24 months	17	31	1.078(0.55-2.11)	<b>1.35 (0.617 -3.96 )</b>
25 months -60 months	49	64	1.504(0.922-2.456)	<b>2.14 (1.186 -3.88)**</b>
≥ 61 months	35	42	1.637(0.944-2.839)	<b>2.57(1.326 -4.973 )**</b>

NB \*\*=P-value <0.005

Method used backward LR

## 5. Discussion

In this study the prevalence of under nutrition among prison inmates who stayed for at least six months was 38.8% [95%CI (33.9-43.9)].

The prevalence of under nutrition in this study was in lined with a study done in Pakistan (39.7%) and lower than in north Gondar prison(Ethiopia) (46.2%) [8, 11] however higher than a study done in Nigeria (4%)and New Guinea (5%) [2, 3].

Variations in Prevalence of under nutrition in this study when compared to the above studies might be due to different socio-economic context between the study areas and methodology what they used.

Work in the prison, duration of stay, additional food besides the food from the prison, self reported illness, and frequencies of food (milk) intake per week were a variable which have significantly associated with under nutrition.

Inmates who engaged in work activity in the prison had 65.4% [AOR=0.346 (95%CI: 0.208-0.574)] less likely to develop under nutrition than inmates didn't engage in work

This may be due to the food which supplied by the prison authority had no enough diversity with the recommended daily allowance or/and so that those individual who have accessed for job have an opportunity to buy additional food items beside the food from the institution.

Those inmates who stayed in the prison for 5 years and above were 2.6 times more likely to develop under nutrition as compared to inmates who stayed less than 1 year in the prison [AOR=2.57 (95%CI:1.326 -4.973 )].This result was an agreement with the finding of other study in Pakistan [8]. The possible reason may be environmental condition that is over crowded room that leads to energy depletion disease like tuberculosis which exposes the inmates under nutrition and also those inmates who stay for long period of time, the chance of getting extra food from their relatives were decreased.

Getting additional foods from the visitors or relatives were significantly associated with under nutrition. Inmates who didn't get additional food from their relatives or visitors were 4.6 times more likely to develop under nutrition as compared to counterpart [AOR= 4.62 (95% CI: 2.884-7.494)]. This result was in lined with a study done in New Guinea

and Pakistan [2, 8]. This may be due to the fact that having additional food from relatives might increase chance for improved dietary diversification and meal frequency in addition to what is served in the prison which may create opportunity to insure energy and micronutrient adequacy.

Self reported illness also other significant variable which had an effect on under nutrition, the odds of under nutrition among the participants who had self reported diseases were 1.6 times higher than inmates who had not self reported illness [AOR=1.6(95%CI: 1.008-2.69)] illness has an effect on nutritional status of an individual because illness like TB, which are common in the prison increase energy expenditure, interfere on nutritional absorption, decreasing appetite, that leads to under nutrition.

Meal frequency (frequency of milk and milk intake per week) was significantly associated with under nutrition, inmates who use milk and milk product had 60% [AOR=0.4(0.173-0.98) less likely to develop under nutrition compared with inmates who didn't get. it is in lined with study done in New Guinea. This may be due to individual who use animal product like milk can improve food diversification and prevent protein energy deficiency.

These investigation represent the prevalence of under nutrition among inmates but the result could not describe the loss of weight was actually occurred in the prison because there was no documented anthropometric characteristics at time of incarceration.

Time of data collection was fasting period for dietary assessment

## **6. Conclusion**

This result showed that the prevalence of under nutrition among prison inmates of incarcerated for at least 6 months was high and job in the prison, self reported illness, duration of stay, additional food and food diversity were associated factor for under nutrition.

## **7. Recommendation**

Base on the major finding of the study the following recommendations are forwarded.

### **To North Gondar prison administrative office: -**

Take an action on nutritional intervention especially for food diversity and improve the health status of the inmates specifically for prisoner who imprisoned for at least 5 years and above.

### **To Amhara region Justice Bureau**

Establish strong cooperation with regional health bureau to intervene on prevention and control of infectious disease which leads to under nutrition

### **To Amhara region technical, Vocational and Educational Agency**

Efforts is needed to train and create a job opportunity after training on different income generating activity, it may help them to get money for buying additional food!

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## ANNEX

### Annex A: Consent form

**University of Gondar**  
**College of medicine and health science**  
**Institute of public health**

#### Consent statement

Questionnaire for assessment of nutritional status to be filled by prison inmates

How are you, my name (data collector name) is \_\_\_\_\_. I would like to ask you a few questions about your socio-demographic status, eating habit, physical activity, illness, depression and smoking with a measurement of height and weight in order to assess the nutritional status of prison inmates among North Gondar prisoners from March 1 to 30, 2015.

This will help us to prevent and control under nutrition among prison inmates in north Gondar prison based on the information obtained from you. Your name will not be written in this form and will never be used in connection with any information you tell us. All information obtained from you will be kept strictly confidential. Your participation is voluntary and you will not be forced to answer any question which you do not want to answer. If you feel discomfort please feel free to stop any time you want. The questions will take about 20 minutes.

Would you like to continue?

1. yes

2. No,

if "No" skip to the next participant

Data collectors name \_\_\_\_\_signature \_\_\_\_\_date\_\_\_\_\_

**Thank you!!**



## **Annex B: Information sheets**

### **Information sheet**

Title of the research: nutritional status and associated factors among prison inmate in north Gondar prison, North West Ethiopia.

Name of principal investigator: Esmael Ali

Name of the organization: University of Gondar, College of medicine and health science, institute of public health

Sponsor of the project: University of Gondar

Purpose of the research project:

The aim of this study is to assess nutritional status and associated factors among prison inmates in north Gondar prison

### **Procedure**

You are selected randomly and we are inviting you to take part in the study. Your participation will help us to assess nutritional and associated factors among prison inmates. We are going ask you some simple questions. Your honest answers are very useful to our study we are going to measure your weight and height. We will like to appreciate your help in responding to these questions.

### **Benefit:**

When you are participating in this research, there may not be direct benefit to you rather you will know your BMI status. However your participation is very indispensable to us in identifying the nutritional status and associated factors among prison inmates in north Gondar prison in order to design and carry out appropriate intervention for the target group

### **Risk and/discomfort**

There is no risk when you are participating in the research project except devoting your time about 20minutes

### **Confidentiality**

The information collected for this research project will be kept secured. Your name will not be written in this format and never be used in connection with any of the information you are going to provide

### **Right to refusal or withdrawal**

You have an absolute right to refuse participating in this research and withdraw at any time

**Contact person**

If you have any questions you can contact the principal investigator by using the following address

Investigator: Esmael Ali

Mobile no, 0918725418

**Advisors**

1. Mrs. Azeb Ateinafu
2. Professor Yigzaw

## Annex C: Amharic version of informed consent and information sheet

የተሳታፊው መረጃ እና የስምምነት መረጋገጫ ፊርማ

ስሜ.....ይባላል፡፡ ይህ ደብዳቤ በዚህ ምርምር ላይ ተሳታፊ እንዲሆኑ ለመጋበዝ ሲሆን የምርምሩ ዓላማም በሰሜን ጎንደር መረጃ ሴት ወስጥ የሚገኙ የህግ ታራቆችን የስነ ምግባር ችግርና ተጓዳኝ/አጋላጭነት ታዎችን ለመግምገም ሲሆን፡ በዚህ ጥናት ላይ ለመሳተፍ የተመረጡት በእርሳ ሲሆን የመሳተፍ ውሳኔው የእርስዎ ነው፡፡ ለመሳተፍ በይፋ ለሚጠየቁት ምንም አይነት ችግር አይኖርም፡፡ ለመሳተፍም ከወሰኑ ምንም አይነት ተጨማሪ ጥቅም ሲጠበቅም አይኖርም፡፡

በዚህ ጥናት ላይ መሳተፍዎ ከፍተኛ ጠቀሜታ አለው ይህም በመረጃ ሴቱ የምግባር እጥረትን፣ አጋላጭ ሁኔታዎችን እና ከምግባር እጥረት ጋር ተያይዞ የሚኖሩትን በሽታ ለመከላከል ያስችላል፡፡ በጥናቱ ላይ በመሳተፍ በእርስዎ ላይ የሚደርስ ምንም አይነት ጉዳት የለም፡፡ በዚህ ጥናት ላይ የሚሳተፉት ማንኛውም አስተያየት እና መልስ በኮድ ስርዓት በሚከፈልዎት የሚቀመጥ ሲሆን ለመንግሥት አይሰጥም፡፡ ስምዎንም ስልክ ቁጥሩንም መስጠት አይጠበቅብዎትም፡፡ ከእርስዎ ፈቃድ እና ህጋዊ መብት ውጭ ሌላ ሌላ ወገን መረጃው አይተላለፍም፡፡ እርስዎ ካልመሳተፉ በዚህ ጥናት ተሳታፊነት ራስዎን የማግለል መብት አለዎት፡፡ ቃለ መጠይቁ 20 ደቂቃ የሚፈጅ ሲሆን በዚህ ጥናት ላይ ለመሳተፍ ከፈለጉ የስምምነት ፋርማ በቅጹ ላይ መረጋገጥ ይኖርብዎታል፡፡ ከዚያም ለመረጃ ሰብሳቢዎች ምላሽ ይሰጣችኋል፡፡

በቃለ መጠይቁ ላይ ለመሳተፍ ፈቃደኛ ነዎት? ☐

አይደለም ☐

### ስለትብብርዎ እና መሳግናለን!!!

#### የተሳታፊው መረጋገጫ

የሰነዱን ደዘት የተረዳሁ ሲሆን የምርምሩ ፕሮጀክቱን ምልላማተረድቻለሁ፡፡ በዚህ ምርምር ፕሮጀክት ላይም ለመሳተፍ ፍቃደኛ ሆኛለሁ፡፡ በማንኛውም ሰዓትም ከጥናቱ ራሴን ለማግለል መብት እንዳለኝ አውቃለሁ፡፡

የተሳታፊው ፊርማ \_\_\_\_\_ ቀን \_\_\_\_\_

የመረጃ ሰብሳቢው ፊርማ \_\_\_\_\_ ቀን \_\_\_\_\_

የሱፐርቪዘር ፊርማ \_\_\_\_\_ ቀን \_\_\_\_\_

## Annex D: Questionnaire (English version)

Date\_\_\_\_\_

Participant identification number\_\_\_\_\_

S.no	Questions	Response	
	Part 1. Socio demographic characteristics		
1	How old are you?	_____years	
2	What is your educational status?	1. Not read and write 2. Read & write 3. Primary 4. Secondary 5. Tertiary	
3	What is your marital status?	1. Single 2. Married 3. Divorced 4. Windowed	
4	What is your religion?	1. Orthodox 2. Muslim 3. Catholic 4. Protestant 5. Others, specify_____	
5	What is your ethnicity?	1. Amhara 2. Tigrie 3. Oromo 4. Others, specify_____	
	Part 3. <b>Behavioral and medical factors</b>		
6	Do you smoke cigarettes in the prison?	1. Yes 2. No	
7	How frequently smoke cigarettes & how many per/day	_____/day and _____in number	
8	Did you have history of known or	YES NO	If no skip

	current chronic illness in the last one month?		to Q 12
9	If yes for Q8 what type of illness?		
10	Duration of illness?	_____	
11	When did you recovered from the illness?	1. Within this week 2. Within two weeks 3. Within three weeks 4. More than three week	
<b>Meal frequency and meal diversity</b>			
12	How many times do you eat per day?	1. More than 3 times 2. Three times 3. Two times 4. Only once	
13	How frequently do you use meat or meat product/week?	1. Once a week 2. Twice a week 3. More than twice a week 4. Nothing	
14	How frequently do you use fruit like orange papaya mango banana/week?	1. Once a week 2. Twice a week 3. More than twice a week 4. Nothing	
15	How frequently do you use egg and egg product/week	1. Once a week 2. Twice a week 3. More than twice a week 4. Nothing	
16	How frequently do you use milk and milk product/week	1. Once a week 2. Twice a week 3. More than twice a week 4. Nothing	
17	Which one of the following foods did you ate in the last 24 hours (during day and night	1. _____cereals(bread,injera.Bis cuits,any foods made from maize sorghum, rice or wheat e.g porridge etc 2. _____Vegetable (sweat potatoes, green paper, Tomatoes ,Cabbage etc)	

		3. _____Fruits;- orange papaya, Mango, banana etc) 4. _____Organ meat(Kidney ,liver, heart etc) 5. _____Eggs 6. _____Fish 7. _____Flesh meat(Beef, lamb, Goat, Chicken 8. _____Legumes, nuts, and seeds(bean, peas ,nuts) 9. _____Milk and milk products (milk, cheese, yoghurt, and other milk products 10. _____Oils and fats (oil, butter, fats or added to cooked foods 11. _____Sweets(Sugar, honey, Sweetened soda, chocolates, candies 12. _____Spices (beverages, tea, coffee etc)	
18	For how long do you stay here in years	_____Months	

Physical activity and work activity			
19	DO you engage in work while you are in prison?	1. Yes 2. No	
20	If the answer is yes for Question 19 what activity/work that you did?	1. Steel work 2. Carpentry and / or Wood work 3. Garment(edetibeb) 4. Cafeteria hostess	
21	How many days do you have work in a week?	_____ days	
22	Do you have any sport activity per week?	1.Yes 2. No	If No skip to Q 24

23	how many days do you have sport fitness or recreational activities/week	_____ days	
24	How long do you spend doing sport fitness or recreational activity /day?	_____Hours and /or minutes	
25	For how long do you sitting Inside your room per day?	_____Hour	
<b>Additional Source of food</b>			
26	Do you have any additional food beside a food from prison authority?	1. Yes 2. No	
27	If yes for Q26 from whom you get additional food	1. From relatives 2. From visitors	
28	How many days do you get additional food /week	_____days	
<b>Availability of latrine facility</b>			
29	What type of toilet do have the institution?	1. Flush toilet 2. Ventilated improved latrine 3. Pit latrine 4. Others, specify	
30	How often the toilets cleaned?	1. Cleaned 2 Or more times/day 2. Only once/day 3. Cleaned every other day	
31	How many inmates live within room where you live?	_____	

<b>Anthropometric measurement</b>			
32	Weight in kilogram	_____	
33	Height in meter	_____	
	BMI		

# Annex E : Amharic Version questionnaire

ጎንደር ዩኒቨርሲቲ፣ ህክምናና ጤና ሳይንስ ኮሌጅ፣ የሚበረሰብ ጤና አጠባበቅ

የጥናት መሳተፊዎች ቅጽ

የተሳታፊው ስም \_\_\_\_\_ እና የመኖሪያ ክፍል \_\_\_\_\_

ቀን \_\_\_\_\_

ተ. ቁ	መግለጫ	መልስ	
	የሚበረሰብ አካላዊና አካላዊ ሚዛን በተመለከተ		
1	እድሜዎ ስንት ነው?	_____ ዓመት	
2	የትምህርት ደረጃ እንዴት ነው?	ማኅበራዊ እና መጽሐፍ አልቸልም ማኅበራዊ እና መጽሐፍ እችላለሁ መጀመሪያ ደረጃ ሁለተኛ ደረጃ ከፍተኛ ትምህርት	
3	የጋብቻ ሁኔታ?	ያላገባ ያገባ የፈታ/ ሚከቱ የሞተችበት	
4	የምን ሀይማኖት ተከታይ ነህ?	አርቶዶክስ መስሊም ካቶሊክ ፕሮቴስታንት ሌላ ካለ ይገለጽ _____	
5	ብሄርህ ምንድን ነው?	አማራ ትግሬ አሮሞ ሌላ ካለ ይገለጽ _____	
	የባህሪና የህክምና ሁኔታ		
6	ሲጋራ አጭጥረው ይወቃሉ?	አዎ አላወቅም	
7	ለጥያቄ ቁጥር 8 መልስዎ አዎ ከሆነ በቀን ስንት ሲጋራ ይጭሉ?	-----ሲጋራ	
	የአሁን የጤና ሁኔታ		
8	ባለፈው አንድ ወር ውስጥ በሐኪም የተረጋገጠ ህመም አጋጥሞዎት ያወቃል?	አዎ የለም	
9	ለጥያቄ ቁጥር 10 መልስዎ አዎ ከሆነ _____		



	የህመሙ አይነት ምን ድን ነው?		
10	ህመሙ ለምን ያክል ጊዜ ቆየ?	_____	
11	ከህመሙ በስንት ጊዜ ውስጥ አገገሙ?	በአንድ ሰዓት ውስጥ በሁለት ሰዓት ውስጥ በሶስት ሰዓት ውስጥ ሌላ ምክንያት ይገለጻል _____	
<b>የተለያዩ ምግብ አይነቶችና ድግግሞሽ (dietary diversity and frequency)</b>			
12	በቀን ስንት ጊዜ ምግብ ትመጣባለህ?	ከሶስት ጊዜ በላይ ሶስት ጊዜ ሁለት ጊዜ 4 አንድ ጊዜ ቤቻ	
13	በሰዓት ምን ያህል ጊዜ ሲጋ አና የስጋ ተዋፆ ትመጣባለህ?	በሰዓት አንድ ጊዜ በሰዓት ሁለት ጊዜ በሰዓት ከሁለት ጊዜ በላይ አልመጣብም	
14	በሰዓት ምን ያህል ጊዜ ፈራፈሬ ተመጣባለህ? (ሙሉ ትመጣብህ፣ ብርቱካን ፓፓያ ወዘተ)	በሰዓት አንድ ጊዜ በሰዓት ሁለት ጊዜ በሰዓት ከሁለት ጊዜ በላይ አልመጣብም	
15	በሰዓት ምን ያህል ጊዜ እንቁላል ተመጣባለህ?	በሰዓት አንድ ጊዜ በሰዓት ሁለት ጊዜ በሰዓት ከሁለት ጊዜ በላይ አልመጣብም	
16	በሰዓት ምን ያህል ጊዜ ወተትና የወተት ተዋፆ ተመጣባለህ?	በሰዓት አንድ ጊዜ በሰዓት ሁለት ጊዜ በሰዓት ከሁለት ጊዜ በላይ አልመጣብም	
17	በለፋት 24 ሰዓት ውስጥ ከተዘረዘሩት የምግብ አይነቶች ውስጥ ስንቱን ተመግቦ ለሀላፊነት ትመጣባለህ?	_____ ጥራጥሬ (ዳቦ, እንጀራ-ብስኩት ወይም ከሙሉ ከገብስ ወይም ከስንዴ የተዘጋጁ ገንጮ 2. _____ ቅጠላ ቅጠል ስከር ድንች, ቃሪያ፣ ቲማቲም ወዘተ 3. _____ ፍራፈሬ፣ ብርቱካን ፓፓያ ሙሉ ጎ እና ሙዝ) 4. _____ ስጋ እንደ የስጋ ተዋፆ (እንኩላሊት, ጉበት, ልብ ወዘተ) 5. _____ እንቁላል 6. _____ አሳ 7. _____ የስጋ ተዋፆ (የፍል ስጋ፣ የደሮ ስጋ 8. _____ ጥራጥሬ (ባቄላ፣ አተር	

		፤ ሽምብራ) 9 _____ ወተትና የወተት ተዋፆ (ወተት፣ አይብ፣ እርጎ እና ሌላ የወተት ተዋፆ _____ ዘይትና እና ቅባት (ዘይት, ቅቤ, ከበሰለ ምግብ ላይ የተጨመረ) _____ ጥፋች ምግቦች (ስኳር፣ ሚር , ጥፋች ማጠጥ፣ ቸኮሌት, _____ አነቃቂ ማጠጥ (ለስላሳ ማጠጥ ሻሂ፣ ቡና ወዘተ)	
18	ለምን ያክል ጊዜ በሚሞሩ ቤቱ ቆጥተዋል?	_____ ወር	
<b>የአካል እንቅስቃሴ እና የስራ ሁኔታ</b>			
19	ሚረሙ ቤቱ ውስጥ እያሉ የተለያዩ ስራ ላይ ይሳተፋሉ?	አዎ አልሳተፍም	
20	ለጥያቄ 19 ማሳሰዎ አዎ ከሆነ ምን አይነት ስራ ላይ ይሳተፋሉ/	ብረታብረት ስራ ጣሊ ስራ የዕደ ጥበብ ስራ ካፈተሪያ አስተናጋጅ	
21	በሳምንት ለምን ያክል ቀን ስራ ይሰራሉ?	_____ ቀን	
22	ከስራዎት በወር ምን ያክል ገቢ ያገኛሉ?	_____ ብር	
23	የአካል ብቃት እንቅስቃሴ ይሰራሉ?	አዎ 2. አልሰራም	
24	ለጥያቄ ቁጥር 23 ማሳሰዎ አዎ ከሆነ በሳምንት ውስጥ ለምን ያክል ቀን የአካል ብቃት ወይም የመዝናኛ እንቅስቃሴዎችን ይሰራሉ?	_____ ቀን	
25	በቀን ለምን ያክል ጊዜ የአካል ብቃት ወይም የመዝናኛ እንቅስቃሴዎችን በማሰራት ያሳልፋሉ?	_____ ደቂቃ	
26	በቀን ውስጥ ለምን ያክል ጊዜ በክፍልዎ ውስጥ ይቀመጡ ወይም ያሳልፋሉ?	_____ ሰዓት	
<b>የምግብ ምንጭ</b>			
27	ሚረሙ ቤቱ ከሚቀርበው በተጨማሪ ሌላ ምግብ የሚያገኙት ማን ድ አለ	አዎ የለም	
28	ለጥያቄ 25 ማሳሰዎ አዎ ከሆነ ከማን ነ ውተጫሜ ምግብ የሚያገኙት	ከዘመድ ከጤቂ	
20	በሳምንት ስንት ቀን ተጨማሪ ምግብ ያገኛሉ	_____ ቀን	
<b>የሚዳጃ አገልግሎት አቅርቦት</b>			
30	ተፅዕኖም አይነት የሚዳጃ ቤት አለው	የቆሻሻ ማከወገጃ ውሃ የተገጠሟት የሽታ ማከወገጃ ትቦ ያለው ደረቅ ሽንት ቤት ብቻ	

		ያለው ሌለምካለ ይገለጽ	
31	ሽንት ቤቱ በየሰንት ጊዜው ይፀዳል?	በቀን ሁለት እና ከዚያ በላይ ጊዜ ይፀዳል በቀን አንድ ጊዜ ብቻ ይፀዳል በየአንድ ቀን ልዩነት ይፀዳል	
<i>ክብደት እና ቁመት ማሳካት</i>			
32	ክብደት በኪሎግ ራም	_____	
33	ቁመት በሜትር	_____	

## Annex F: Assurance of investigation

The undersigned agrees to accept responsibility for the scientific, ethical, and technical conduct of the research project and for provision of the required progress report as preterm and condition of the research and publication office of the University of Gondar.

Name of the student: Esmael Ali

Date \_\_\_\_\_ Signature: \_\_\_\_\_

Approval of the advisors

Advisors:

Name	Signature	Date
1. _____	_____	_____
2. _____	_____	_____

### **Annex G: Declaration**

I, the undersigned senior MPH student declare that this thesis is my original work in partial fulfillment of the requirement of degree of master of public health.

Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Place of submission: Institute of Public Health, College of medicine and health science, University of Gondar

**Date of submission:** \_\_\_\_\_

This thesis work has been submitted for examination with my/our approval of as University advisor(s)

#### **Advisors**

Name	Signature
_____	_____
_____	_____



## Annex H: BMI calculation chart

### Annex-: BMI calculation chart

